

Chapter 11

Configure Channelized Interfaces

Channelized interfaces enable you to configure a number of individual channels that subdivide the bandwidth of a larger interface and minimize the number of PICs that an installation requires.

You can configure various types of channelized interfaces, described in the following sections of this chapter:

Configure Channelized DS-3 to DS-0 Interfaces on page 191

Configure Channelized DS-3 to DS-1 Interfaces on page 197

Configure Channelized E1 Interfaces on page 201

Configure Channelized OC-12 Interfaces on page 204

Configure Channelized STM-1 Interfaces on page 206

Configure Channelized DS-3 to DS-0 Interfaces

To configure Channelized DS-3 to DS-0 interface properties, you can include the t3-options, t1-options, or ds0-options statements. Only a subset of the T3 options is valid for this configuration, and the buildout, invert-data, and line-encoding statements under t1-options are ignored; the following configurations list all the valid parameters.



Note

The set of options the software applies to the interface depends on how you specify the interface name. For more information, see “Channelized DS-3 to DS-0 Interface Naming” on page 192.

To specify options for the T3 side of the connection, include the t3-options statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]  
t3-options {  
  bert-algorithm algorithm;  
  bert-error-rate rate;  
  bert-period seconds;  
  (cbit-parity | no-cbit-parity);  
  (long-buildout | no-long-buildout);  
  loopback (local | remote);  
}
```

The statements in the t3-options hierarchy are supported only for channel 0; they are ignored if configured on other channels.

To specify options for each of the T1 channels, include the t1-options statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
t1-options {
  byte-encoding (nx64 | nx56);
  fcs (32 | 16);
  framing (sf | esf);
  idle-cycle-flag (flags | ones);
  invert-data;
  loopback (local | remote);
  start-end-flag (shared | filler);
  timeslots slot-number;
}
```

To specify options for each of the DS-0 channels, include the ds0-options statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
ds0-options {
  byte-encoding (nx64 | nx56);
  fcs (32 | 16);
  idle-cycle-flag (flags | ones);
  invert-data;
  start-end-flag (shared | filler);
}
```

For more information about specific parameters, see “Configure E1 and T1 Physical Interface Properties” on page 64 and “Configure E3 and T3 Physical Interface Properties” on page 70. For a configuration example, see “Example: Configure Channelized DS-3 to DS-0 Interfaces” on page 194.

Channelized DS-3 to DS-0 Interface Naming

You can configure 28 T1 channels per T3 interface. Each T1 link can have up to eight DS-0 channel groups, and each channel group can hold any combination of DS-0 timeslots. To specify the T1 link and DS-0 channel group number in the interface name, use colons (:) as separators. For example, a Channelized DS-3 to DS-0 PIC might have the following physical and virtual interfaces:

```
ds-0/0/0:x:y
```

where *x* is a T1 link ranging from 0 through 27 and *y* is a DS-0 channel group ranging from 0 through 7 (see Table 14 on page 193 for more information about ranges).

You can use any of the values within the range available for *x* and *y*, and you do not have to configure the links sequentially. In addition, the software applies the interface options you configure according to the following rules:

To configure the t3-options, you must set the T1 link *x* to 0 and channel group *y* to 0:

```
ds-0/0/0:0:0.
```

To configure the t1-options, you must set channel group *y* to 0; the T1 link *x* can be any value:

```
ds-0/0/0:x:0
```

There are no restrictions on configuring the ds0-options.

If you delete a configuration you previously committed for channel group 0, the options return to default values.

To configure the channel groups and timeslots for a Channelized DS-3 to DS-0 interface, include the channel-group and timeslots statements at the [edit chassis fpc *slot-number* pic *pic-number* ct3 port *port-number* t1 *link-number*] hierarchy level:

```
[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number]
channel-group group-number timeslots slot-number;
```



Note

If you commit the interface name but do not include the [edit chassis] configuration, the Channelized DS-3 to DS-0 PIC behaves like a Channelized DS-3 to DS-1 PIC: none of the DS-0 functionality is accessible.

Table 14 shows the ranges for each of the quantities in the preceding configuration:

Table 14: Ranges for Channelized DS-3 to DS-0 Configuration

Item	Variable	Range
FPC slot	<i>slot-number</i>	0 through 7 (see note below)
PIC slot	<i>pic-number</i>	0 through 3
Port	<i>port-number</i>	0 through 1
T1 link	<i>link-number</i>	0 through 27
DS-0 channel group	<i>group-number</i>	0 through 7
timeslot	<i>slot-number</i>	1 through 24



Note

FPC slot range depends on platform. The maximum range of 0 through 7 applies to M40, M40e, M160, T320, and T640 platforms; for M20 routers, the range is 0 through 3; for M10 routers the range is 0 through 1; for M5 routers, the only applicable value is 0.

Bandwidth limitations restrict the interface to a maximum of 128 channel groups per T3 port, rather than the theoretical maximum of $8 * 28 = 224$.

There are 24 timeslots on a T1 interface. You can designate any combination of timeslots for usage, but you can use each timeslot number on only one channel group within the same T1 link.

To use timeslots 1 through 10, configure *slot-number* as follows:

```
[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number]
channel-group group-number timeslots 1-10;
```

To use timeslots 1 through 5, timeslot 10, and timeslot 24, configure *slot-number* as follows:

```
[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number]
channel-group group-number timeslots 1-5,10,24;
```

Note that spaces are not allowed in specifying timeslot numbers.

Example: Configure Channelized DS-3 to DS-0 Interfaces

The following configuration is sufficient to get the Channelized DS-3 to DS-0 interface up and running. The T3 interface can be divided into 28 channels, each at T1 line rate. For their logical interfaces, DS-3 channels can use the following encapsulation types:

PPP, PPP CCC, and PPP TCC

Frame Relay, Frame Relay CCC, and Frame Relay TCC

Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

For more information, see “Configure a Point-to-Point Frame Relay Connection” on page 108.



Note

All these configuration examples specify channel group 0 in the interface address, which is required for configuring the t3-options and t1-options statements.

Configure Cisco HDLC encapsulation on a Channelized DS-3 to DS-0 interface:

```
[edit interfaces]
ds-2/0/1:20:0 {
  encapsulation cisco-hdlc;
  unit 0 {
    family inet {
      address 20.0.4.40/32 {
        destination 20.0.4.41;
      }
    }
  }
}
```

```
[edit chassis]
  fpc 2 {
    pic 0 {
      ct3 {
        port 1 {
          t1 20 {
            channel-group 0 timeslots 1-5;
          }
        }
      }
    }
  }
}
```

Configure PPP encapsulation on a Channelized DS-3 to DS-0 interface:

```
[edit interfaces]
ds-2/0/1:20:0 {
  encapsulation ppp;
  unit 0 {
    family inet {
      address 20.0.4.40/32 {
        destination 20.0.4.41;
      }
    }
  }
}
[edit chassis]
  fpc 2 {
    pic 0 {
      ct3 {
        port 1 {
          t1 20 {
            channel-group 0 timeslots 1-5;
          }
        }
      }
    }
  }
}
```

Configure three Frame Relay DLCIs on a Channelized DS-3 interface:

```
[edit interfaces]
t1-5/1/3:0 {
  mtu 9192;
  encapsulation frame-relay;
  unit 1 {
    dlci 101;
    family inet {
      mtu 9000;
      address 10.123.1.2/32 {
        destination 10.123.1.1;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
}
```

```

unit 2 {
    dlci 102;
    family inet {
        mtu 9000;
        address 10.123.1.4/32 {
            destination 10.123.1.3;
        }
    }
    family iso {
        mtu 9000;
    }
    family mpls {
        mtu 9000;
    }
}
unit 3 {
    dlci 103;
    family inet {
        mtu 9000;
        address 10.123.1.6/32 {
            destination 10.123.1.5;
        }
    }
    family iso {
        mtu 9000;
    }
    family mpls {
        mtu 9000;
    }
}

```

Configure Cisco HDLC encapsulation with byte-encoding:

```

[edit interfaces ds-0/1/0:5:0]
no-keepalives;
encapsulation cisco-hdlc;
ds0-options {
    byte-encoding nx56;
}
unit 0 {
    family inet {
        address 10.221.2.8/24;
    }
}

```

Configure Cisco HDLC encapsulation with byte-encoding and framing:

```

[edit interfaces ds-0/1/0:5:0]
no-keepalives;
encapsulation cisco-hdlc;
t1-options {
    byte-encoding nx56;
    framing sf;
}
unit 0 {
    family inet {
        address 10.221.2.8/24;
    }
}

```

Configure Channelized DS-3 to DS-1 Interfaces

To configure Channelized DS-3 to DS-1 interface properties, you can include both the t1-options and t3-options statements. Only a subset of the T3 options is valid for this configuration, and the buildout, invert-data, and line-encoding statements under t1-options are ignored; the following configuration lists all the valid parameters.

To specify options for the T3 side of the connection, include the t3-options statement at the [edit interfaces *interface-name*] hierarchy:

```
[edit interfaces interface-name]
t3-options {
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  (cbit-parity | no-cbit-parity);
  (feac-loop-respond | no-feac-loop-respond);
  loopback (local | remote);
}
```

The statements in the t3-options hierarchy are supported only for channel 0; they are ignored if configured on other channels.

To specify options for each of the T1 channels, include the t1-options statement at the [edit interfaces *interface-name*] hierarchy:

```
[edit interfaces interface-name]
t1-options {
  byte-encoding (nx64 | nx56);
  fcs (32 | 16);
  framing (sf | esf);
  idle-cycle-flag (flags | ones);
  loopback (local | remote);
  start-end-flag (shared | filler);
  timeslots slot-number;
}
```

For more information about specific parameters, see “Configure E1 and T1 Physical Interface Properties” on page 64 and “Configure E3 and T3 Physical Interface Properties” on page 70. For a configuration example, see “Example: Configure Channelized DS-3 to DS-1 Interfaces” on page 198.

Channelized DS-3 Interface Naming

You can configure 28 T1 channels per T3 interface, and each interface can have logical interfaces. To specify the channel number, include it after the colon (:) in the interface name. For example, a four-port T3 PIC in FPC 1 and slot 1 will have the following physical interfaces, depending on the media type:

```
t1-1/1/0:x
t1-1/1/1:x
t1-1/1/2:x
t1-1/1/3:x
```

x is a channel number ranging from 0 through 27.

Example: Configure Channelized DS-3 to DS-1 Interfaces

The following configuration is sufficient to get the Channelized DS-3 interface up and running. The T3 interface can be divided into 28 channels, each at T1 line rate. For their logical interfaces, DS-3 channels can use the following encapsulation types:

PPP, PPP CCC, and PPP TCC

Frame Relay, Frame Relay CCC, and Frame Relay TCC

Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

For more information, see “Configure a Point-to-Point Frame Relay Connection” on page 108.

Configure Cisco HDLC encapsulation on a Channelized DS-3 interface:

```
[edit interfaces]
t1-2/0/1:20 {
  encapsulation cisco-hdlc;
  unit 0 {
    family inet {
      address 20.0.4.40/32 {
        destination 20.0.4.41;
      }
    }
  }
}
```

Configure PPP encapsulation on a Channelized DS-3 interface:

```
[edit interfaces]
t1-2/0/1:20 {
  encapsulation ppp;
  unit 0 {
    family inet {
      address 20.0.4.40/32 {
        destination 20.0.4.41;
      }
    }
  }
}
```


Configure five Frame Relay DLCIs on a Channelized DS-3 interface:

```
[edit interfaces]
t1-5/1/3:0 {
  mtu 9192;
  encapsulation frame-relay;
  unit 1 {
    dlc1 101;
    family inet {
      mtu 9000;
      address 10.123.1.2/32 {
        destination 10.123.1.1;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
  unit 2 {
    dlc1 102;
    family inet {
      mtu 9000;
      address 10.123.1.4/32 {
        destination 10.123.1.3;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
  unit 3 {
    dlc1 103;
    family inet {
      mtu 9000;
      address 10.123.1.6/32 {
        destination 10.123.1.5;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
  unit 4 {
    dlc1 104;
    family inet {
      mtu 9000;
      address 10.123.1.8/32 {
        destination 10.123.1.7;
      }
    }
    family iso {
      mtu 9000;
    }
  }
}
```

```

    family mpls {
      mtu 9000;
    }
  }
  unit 5 {
    dlc1 105;
    family inet {
      mtu 9000;
      address 10.123.1.10/32 {
        destination 10.123.1.9;
      }
    }
    family iso {
      mtu 9000;
    }
    family mpls {
      mtu 9000;
    }
  }
}

```

Configure Cisco HDLC encapsulation with byte-encoding:

```

[edit interfaces t1-1/1/0:1]
no-keepalives;
encapsulation cisco-hdlc;
t1-options {
  byte-encoding nx56;
}
unit 0 {
  family inet {
    address 10.221.2.8/24;
  }
}

```

Configure Cisco HDLC encapsulation with byte-encoding and framing:

```

[edit interfaces t1-1/1/0:1]
no-keepalives;
encapsulation cisco-hdlc;
t1-options {
  byte-encoding nx56;
  framing sf;
}
unit 0 {
  family inet {
    address 10.221.2.8/24;
  }
}

```

Configure Channelized E1 Interfaces

To configure Channelized E1 interface properties, you can include the `e1-options` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
e1-options {
  fcs (32 | 16);
  framing (g704 | g704-no-crc4 | unframed);
  idle-cycle-flag (flags | ones);
  loopback (local | remote);
  start-end-flag (shared | filler);
}
```

To specify options for each of the DS-0 channels, include the `ds0-options` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
ds0-options {
  byte-encoding (nx64 | nx56);
  fcs (32 | 16);
  idle-cycle-flag (flags | ones);
  loopback (local | remote);
  start-end-flag (shared | filler);
}
```



The set of options the software applies to the interface depends on how you specify the interface name. For more information, see “Channelized E1 Interface Naming” on page 201.

Only a subset of the E1 options is valid for the channelized configuration; you specify the timeslots using the `[edit chassis]` configuration described in “Channelized E1 Interface Naming” on page 201. For more information about the E1 and DS-0 options, see “Configure E1 and T1 Physical Interface Properties” on page 64.

Channelized E1 Interface Naming

Each Channelized E1 PIC has 10 E1 ports that you can channelize to the *NxDS-0* level. Each E1 interface has 32 timeslots (DS-0), in which timeslot 0 is reserved. You can combine one or more of these DS-0 timeslots (channels) to create a channel group (*NxDS-0*). There can be a maximum of 24 channel groups per E1 interface. Thus, you can configure a maximum of 240 channel groups per PIC (10 ports x 24 channel groups per port).

To specify the DS-0 channel group number in the interface name, include a colon (:) as a separator. For example, a Channelized E1 PIC might have the following physical and virtual interfaces:

```
ds-0/0/0:x
```

where *x* is a DS-0 channel group ranging from 0 through 23 (see Table 15 on page 203 for more information about ranges).

You can use any of the values within the range available for *x*; you do not have to configure the links sequentially. In addition, the software applies the interface options you configure according to the following rules:

1. To configure the e1-options statement, you must set channel group *x* to 0:

```
ds-0/0/0:0
```

2. There are no restrictions on configuring the ds0-options.
3. If you delete a configuration you previously committed for channel group 0, the options return to default values.

To configure the channel groups and timeslots for a Channelized E1 interface, include the channel-group and timeslots statements at the [edit chassis] hierarchy level:

```
[edit chassis]
  fpc slot-number {
    pic pic-number {
      ce1 {
        e1 link-number {
          channel-group group-number timeslots slot-number;
        }
      }
    }
  }
```



Note

If you commit the interface name but do not include the [edit chassis] configuration, the Channelized E1 PIC behaves like a standard E1 PIC: none of the DS-0 functionality is accessible.

For example:

```
[edit chassis]
  fpc 0 {
    pic 1 {
      ce1 {
        e1 0 {
          channel-group 1 timeslots 1;
          channel-group 5 timeslots 5-7;
        }
        e1 4 {
          channel-group 10 timeslots 11,17, 28-31;
        }
      }
    }
  }
```

creates the following interfaces:

```
ds-0/1/0:1
ds-0/1/0:5
ds-0/1/4:10
```

Note that the remaining ports (other than 0 and 4) remain as regular E1 interfaces (and follow the e1-0/1/x naming convention).

Table 15 shows the ranges for each of the quantities in the preceding configuration:

Table 15: Ranges for Channelized E1 Configuration

Item	Variable	Range
FPC slot	<i>slot-number</i>	0 through 7
PIC slot	<i>pic-number</i>	0 through 3
E1 link	<i>link-number</i>	0 through 9
DS-0 channel group	<i>group-number</i>	0 through 23
timeslot	<i>slot-number</i>	1 through 32 (with timeslot 1 reserved)



Note

FPC slot range depends on platform. The maximum range of 0 through 7 applies to M40 routers; for M20 routers, the range is 0 through 3; for M10 routers the range is 0 through 1; for M5 routers, the only applicable value is 0. (The Channelized E1 PIC is not supported on T-series platforms.)

The theoretical maximum number of channel groups possible per PIC is $10 * 24 = 240$. This is within the maximum bandwidth available.

There are 32 timeslots on an E1 interface. You can configure any combination of timeslots. However, timeslot 0 is reserved.

To use timeslots 1 through 10, configure *slot-number* as follows:

```
[edit chassis fpc slot-number pic pic-number ce1 e1 link-number]
channel-group group-number timeslots 1-10;
```

To use timeslots 1 through 5, timeslot 10, and timeslot 24, configure *slot-number* as follows:

```
[edit chassis fpc slot-number pic pic-number ce1 e1 link-number]
channel-group group-number timeslots 1-5,10,24;
```

Note that spaces are not allowed in specifying timeslot numbers.



Note

For channelized fractional E1 interfaces only, when you include the timeslots statement at the [edit interfaces interface-name e1-options] hierarchy level, timeslot 1 is reserved, so you must allocate timeslots in the range of 2 through 32. Alternatively, you can configure timeslots by including the channel-group and timeslots statements at the [edit chassis] hierarchy level, in which case you can allocate timeslots in the range of 1 through 31.

Example: Configure Channelized E1 Interfaces

The following configuration is sufficient to get the Channelized E1 interface up and running:

```
[edit chassis]
  fpc 0 {
    pic 1 {
      ce1 {
        e1 0 {
          channel-group 0 timeslots 1;
          channel-group 1 timeslots 2;
          channel-group 5 timeslots 5-7;
        }
        e1 4 {
          channel-group 10 timeslots 11,17, 28-31;
        }
      }
    }
  }

[edit interfaces ds-0/1/0:0]
  e1-options {
    fcs 32;
    framing g704-non-grc;
    loopback remote;
  }

[edit interfaces ds-0/1/4:10]
  ds0-options {
    byte-encoding nx56;
    start-end-flag filler;
  }
```

Configure Channelized OC-12 Interfaces

To configure Channelized OC-12 interface properties, you can include the `sonet-options` and `t3-options` statements. Some of the SONET options are ignored and some can only be configured for channel 0, though they apply equally to all channels. The long-buildout statement under `t3-options` is also ignored. For more information, see “Configure SONET/SDH Physical Interface Properties” on page 82 and “Configure E3 and T3 Physical Interface Properties” on page 70. You can configure 12 channels per interface, and each interface can have logical interfaces. For a configuration example, see “Example: Configure Channelized OC-12 Interfaces” on page 204.

Example: Configure Channelized OC-12 Interfaces

The following configuration is sufficient to get the Channelized OC-12 interface up and running. The OC-12 interface can be divided into 12 channels. DS-3 channels can use the following encapsulation types:

PPP, PPP CCC, and PPP TCC

Frame Relay, Frame Relay CCC, and Frame Relay TCC

Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

The channels can also have logical interfaces.

```
[edit interfaces]
t3-fpc/pic/port:0 {
  encapsulation cisco-hdlc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.1/30;
    }
    family iso;
  }
}
t3-fpc/pic/port:1 {
  encapsulation ppp;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.5/30;
    }
    family iso;
  }
}
t3-fpc/pic/port:2 {
  encapsulation frame-relay;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    dlci 100;
    family inet {
      address 10.11.30.9/30;
    }
    family iso;
  }
  unit 1 {
    dlci 101;
    family inet {
      address 10.11.31.9/30;
    }
    family iso;
  }
}
t3-1fpc/pic/port:3 {
  encapsulation cisco-hdlc-ccc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0;
}
```

```

t3-fpc/pic/port:4 {
  encapsulation ppp-ccc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0;
}
t3-fpc/pic/port:5 {
  dce;
  encapsulation frame-relay-ccc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    encapsulation frame-relay-ccc;
    dlc1 1000;
  }
  unit 1 {
    encapsulation frame-relay-ccc;
    dlc1 1001;
  }
}

```

Configure Channelized STM-1 Interfaces

To configure the interface properties for Channelized STM-1 to E1 PICs, you include statements for both sides of the connection: `e1-options` and `sonet-options` statements. The following configurations list all the valid statements.

To specify options for each of the E1 channels on the Channelized STM-1 to E1 PIC, include the `e1-options` statement at the [edit interfaces *interface-name*] hierarchy level:

```

[edit interfaces interface-name]
e1-options {
  bert-error-rate;
  bert-period;
  fcs (32 | 16);
  framing (g704 | g704-no-crc4 | unframed);
  idle-cycle-flag (flags | ones);
  loopback (local | remote);
  start-end-flag (shared | filler);
  timeslots slot-number;
}

```



Note

When a channelized STM-1 interface experiences a line transition, the E1 channels configured in unframed mode log a large number of drops (around 24,000) as the channelized STM-1 interface clocks resynchronize. This does not occur on framed channels, because the framing resynchronizes clocks very quickly.

To specify options for the SONET/SDH side of the connection, include the `sonet-options` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
sonet-options {
  bytes {
    e1-quiet value;
    f1 value;
    f2 value;
    s1 value;
    z3 value;
    z4 value;
  }
  loopback (local | remote);
}
```



On Channelized STM-1 interfaces, you should configure the clock source at one side of the connection to be internal (the default JUNOS configuration) and configure the other side of the connection to be external.

For more information about specific statements, see “Configure E1 and T1 Physical Interface Properties” on page 64 and “Configure SONET/SDH Physical Interface Properties” on page 82. For a configuration example, see “Example: Configure Channelized STM-1 Interfaces” on page 209.

Channelized STM-1 Interface Naming

You can configure up to 63 E1 channels per single-port Channelized STM-1 to E1 PIC. To specify the channel number, include it after the colon (:) in the interface name. For example, a Channelized STM-1 to E1 PIC in FPC 1 and slot 1 will have the following physical interfaces, depending on the media type:

`e1-1/1/0:x`

`x` is an E1 channel number ranging from 0 through 62.

Channelized STM-1 Interface Virtual Tributary Mapping

You can configure virtual tributary mapping to use KLM mode or ITU-T mode. To configure virtual tributary mapping, include the `vtmapping` statement at the `[edit chassis fpc slot-number pic pic-number]` hierarchy level:

```
[edit chassis fpc slot-number pic pic-number]
vtmapping (klm | itu-t);
```

By default, virtual tributary mapping uses KLM mode. For more information, see the *JUNOS Internet Software Configuration Guide: Getting Started*.

Table 16 lists the KLM mappings used by the Channelized STM-1 to E1 PIC interfaces. The PIC defaults to KLM numbering with an offset of -1; for example, KLM 1 = STM-1 PIC 0, as shown in the table.

Table 16: Channelized STM-1 to E1 Channel Mapping

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
0	1	1	1	1	1
1	2	1	1	2	22
2	3	1	1	3	43
3	4	1	2	1	4
4	5	1	2	2	25
5	6	1	2	3	46
6	7	1	3	1	7
7	8	1	3	2	28
8	9	1	3	3	49
9	10	1	4	1	10
10	11	1	4	2	31
11	12	1	4	3	52
12	13	1	5	1	13
13	14	1	5	2	34
14	15	1	5	3	55
15	16	1	6	1	16
16	17	1	6	2	37
17	18	1	6	3	58
18	19	1	7	1	19
19	20	1	7	2	40
20	21	1	7	3	61
21	22	2	1	1	2
22	23	2	1	2	23
23	24	2	1	3	44
24	25	2	2	1	5
25	26	2	2	2	26
26	27	2	2	3	47
27	28	2	3	1	8
28	29	2	3	2	29
29	30	2	3	3	50
30	31	2	4	1	11
31	32	2	4	2	32
32	33	2	4	3	53
33	34	2	5	1	14
34	35	2	5	2	35
35	36	2	5	3	56
36	37	2	6	1	17
37	38	2	6	2	38
38	39	2	6	3	59
39	40	2	7	1	20
40	41	2	7	2	41

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
41	42	2	7	3	62
42	43	3	1	1	3
43	44	3	1	2	24
44	45	3	1	3	45
45	46	3	2	1	6
46	47	3	2	2	27
47	48	3	2	3	48
48	49	3	3	1	9
49	50	3	3	2	30
50	51	3	3	3	51
51	52	3	4	1	12
52	53	3	4	2	33
53	54	3	4	3	54
54	55	3	5	1	15
55	56	3	5	2	36
56	57	3	5	3	57
57	58	3	6	1	18
58	59	3	6	2	39
59	60	3	6	3	60
60	61	3	7	1	21
61	62	3	7	2	42
62	63	3	7	3	63

Example: Configure Channelized STM-1 Interfaces

The following configuration is sufficient to get the Channelized STM-1 to E1 PIC interface up and running. The Channelized STM-1 to E1 interface is an STM-1 that is divided into 63 E1 interfaces. E1 interfaces can use the following encapsulation types:

PPP, PPP CCC, and PPP TCC

Frame Relay, Frame Relay CCC, and Frame Relay TCC

Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

The channels can also have logical interfaces; however, each E1 channel can support a maximum of 64 Frame Relay data link connection identifiers (DLCIs), numbered from 1 to 63. For more information, see “Configure a Point-to-Point Frame Relay Connection” on page 108.

You configure all SONET/SDH options that apply to the STM-1 interface in the sonet-options configuration block of the first E1 interface statement in the configuration.

```
[edit]
interfaces {
  e1-fpc/pic/port:0 {
    encapsulation cisco-hdlc;
    sonet-options {
      no-z0-increment;
    }
    e1-options {
      framing g704;
    }
    unit 0 {
      family inet {
        address 10.11.30.1/30;
      }
    }
  }
  e1-fpc/pic/port:1 {
    encapsulation frame-relay;
    e1-options {
      framing g704;
    }
    unit 1 {
      dlci 16;
      family inet {
        address 10.11.31.9/30;
      }
    }
  }
  e1-fpc/pic/port:2 {
    encapsulation ppp;
    no-keepalives;
    unit 0 {
      family inet {
        address 10.11.31.47/30;
      }
    }
  }
}

[edit]
chassis {
  fpc 2 {
    pic 0 {
      vtmapping klm;
    }
  }
}
```